

REMARKS

1. The Patent Office Action of January 18, 2006 is hereby acknowledged. The shortened statutory period of three (3) months time period for response to the Office Action expired on April 18, 2006. This amendment is being mailed by United States Express Mail, Express Mail Label No. EV 824162588 US, in a postage paid envelope addressed to Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on May 17, 2006. Concurrently with the filing of this amendment, the Applicant has requested a one month extension of time and has paid the required fee. Accordingly, the deadline to now file a responsive amendment is May 18, 2006. Therefore, this amendment is timely filed. In the event that the Commissioner for Patents should determine that any additional fee is required for this Amendment to be timely filed and an appropriate fee is due for that extension of time, then the Commissioner for Patents is hereby authorized to charge Deposit Account Number 18-2222 for such appropriate fee.

2. In addition, the Applicants have paid fee for the Continuation Application in the amount of \$395.00. In the event that the Commissioner for Patents should determine that any additional fee is required for this Continuation Application, then the Commissioner for Patents is hereby authorized to charge Deposit Account Number 18-2222 for such appropriate fee.

3. The Applicants wish to remind the Examiner that Claims 19 through 22 is still not mentioned in this Office Action of January 18, 2006, which is what also happened in the last Office Action of March 2, 2005. Therefore, the Applicants reproduce the Section 3 of the last Amendment for Claims 19 through 22 in the claims of the '101 Application. In the Office Action of March 2, 2005, Patent Examiner Jenkins rejected Claims 1 through 18 but did not discuss Claims 19 through 22. In a telephone conversation between Examiner Jenkins and Applicant's attorney Thomas I. Rozsa on Sunday, June 26, 2005, Examiner

Jenkins agreed that Claims 19 through 22 were still in the case and the failure to address them in the Office Action was simply an oversight. Accordingly, all twenty-two claims of invention are still presently in the case”.

4. The Patent Examiner’s very detailed analysis of the patent application is acknowledged with appreciation.

5. The Applicants will now address the Examiner’s rejection of the Claims 1-22 under 35 U.S.C. 112, wherein the Examiner specifically states:

“3. Claims 1-22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The term “about 100% is not defined by the Specification and the limit of which is not clear to one of ordinary skill in art. Additionally, the term is in conflict with dependent claims 13, 19 and 20 which further limit claim 1, and in particular, step “c” ti densities below 100%”, and

“5. Claims 1-22 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contain subject matter which was not describes in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time application was filled, had possession of the claimed invention. The term “about 100%” is not discloses or supported in the disclosure as originally filled”

The Applicants acknowledge what the Examiner has stated concerning the words “about 100%” in Claim element “c”. This has now been amended to read “between about 98% and 100% of theoretical density”. This is fully supported in the patent application. The Applicants wish to refer the Examiner to the antecedent basis in specification of the ‘101 Application where it originally states:

“Step 4: Consolidating the Framed -compact to Form a Framed-Billet” (Page 9,

Line 17"

"(1) Vacuum/Inert-gas/Air Hot-Press" (Page 9, Line 25), ... "While the consolidation temperature and vacuum, inert-gas or air are maintained, the degassed-compact is pressed to full density resulting in a framed-billet" (Page 10, Lines 10-12)

"(3) Cold Compacting/Hot Press" (Page 11, Line 14), ... "While the consolidation temperature and inert-gas continue to be maintained, the framed-compact is hot pressed to approximately 98 to 100% of the theoretical density to produce the framed-billet" (Page 11, Lines 17-19).

It is very clear that at the step of consolidation in manufacturing, which corresponds to element "c" of independent Claim 1, the Application originally discloses that the processes of Vacuum/Inert-gas/Air Hot-Press, and Cold Compacting/Hot Press make the framed MMC billet to reach respective "full density" and "approximately 98 to 100% of theoretical density to produce the frame-billet". Therefore, one having ordinary skill in the art of science and engineering after reading the above disclosed results of the billet density will not have any difficulties to accept the claimed "that is about 100% of theoretical density". In conclusion, as the Applicants believe that Claims 1-22 meet the antecedent requirements to overcome the 35 U.S.C. § 112 rejection, Claims 1-22 are in allowable form.

6. Through this amendment the Applicants have amended Claim 1 to add to claim element (a) the wording so that it now reads:

"a. producing said powder mixture by mixing a matrix metal powder and at least one reinforcement material, wherein said matrix metal powder does not undergo liquidization during the entire processes of said method of producing a framed-metal-matrix composite-sheet."

The Applicants provide analysis in Section 7.2.3 of this Amendment to support the addition of "wherein said matrix metal powder does not undergo liquidization during the

entire processes of said method of producing a framed-metal-matrix composite-sheet”, which added claim element differentiates the ‘101 Application from United States Patent 3,840,367 issued to Rudy cited by the Examiner in this Office Action.

7. The Applicants will now address the Examiner’s final rejection of the Claims of the ‘101 Application under 35 U.S.C. § 103(a). The Patent Examiner has cited two new references, United States Patent 3,834,004 issued to Ayers (the “Ayers Patent”) and United States Patent 3,840,367 issued to Rudy (the “Rudy Patent”) against the ‘101 Application.

Specifically the Examiner states: “ 7. Claims 1-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Pat. No. 3,834,004 (Ayers) in view of Rudy. Ayers discloses the invention substantially as claimed. Ayers discloses a method of making a composite sheet comprising,..., However, Ayers does not disclose wherein a powder mixture containing a reinforcing material. Rudy teaches to add particles to tool steel powders in order to improve the toughness of the steel (col. 2, lines 8-29).

The Applicants respectfully disagree with the Examiner since one having ordinary skill in the art of materials science and engineering can easily find structural differences between from the Ayers and Rudy Patents and the ‘101 Application. Specifically, the Ayers Patent is for a steel billet from a single alloy of very irregular shaped steel particles, which chemically is an alloy of steel , and is not a composite. The Rudy Patent is also for a cemented carbide alloy, and chemically is a solid compound and not a composite. In contrast, the ‘101 Application is for a composite, which is a mixture compounded by at least two kinds of different materials, which remain distinct in the final product.

The Applicants state “To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the

1 art, to modify the reference or to combine reference teachings. Second, there must be a
2 reasonable expectation of success. Finally, the prior art reference (or references when
3 combined) must teach or suggest all the claim limitation. The teaching or suggestion to
4 make the claimed combination and the reasonable expectation of success must be both be
5 found in the prior art and not based on applicant's disclosure. In re Vaack, 947 F.2d 488, 20
6 USPQ2d 1438 (Fed. Cir. 1991)" (MPEP, 706.02(k) 700-45). The Applicants respectfully
7 present analysis that differentiates the structure elements of the '101 Application from the
8 Ayers and Rudy Patents in sections 7.1 and 7.2 below.

9
10 7.1 The Ayers Patent is a "*method of producing tool steels in billet form*"
11 (Abstract), which "*the process of the invention involves the preparing of supply of molten*
12 *metal of tool steel analysis*" (Col. 2, Lines 60-62).

13
14 7.1.1 In the Ayers patented powder metallurgy, the steel may have
15 "*1 percent or more by weight of tungsten, vanadium, molybdenum, cobalt or chromium and*
16 *containing 0.3 percent or more carbon*" (Col. 2, Lines 65-67, and Col. 3, Line 1). The steel
17 powder is obtained through liquid atomization, where "*As the molten metal stream enters the*
18 *chamber, it is impinged upon in a plurality of closely spaced stages by opposed pair of high*
19 *pressure jets of cooling liquid,...*" (Col. 3, Lines 24-27). The above disclosure is
20 substantially different from the "composite" of the '101 Application. First, metal alloy is not
21 a composite. This statement will be further discussed in section 5.2 when discussing the
22 Rudy Patent. Second, there is NO powder mixture in the Ayers Patent since the molten steel
23 through liquid atomization only can produce powder of the steel particles with different
24 sizes, wherein all the steel particles have the same chemical composition. Therefore, the
25 Ayers Patent does not teach the "powder mixture" and "composite" that are taught by the
26 '101 Application.

27
28 7.1.2 The Ayers Patent states that the powder contains "*highly*

1 *irregular shaped atomized particles of very low oxide content*" (Col. 3, Lines 40-41), which
2 is "*highly desirable for the purpose of the present invention*" (Col. 3, Lines 35-36). Further
3 the powder has a particle size composition of "*28-100 mesh- 45 percent, 100-200 mesh- 35*
4 *percent, 200-325 mesh- 14 percent, and smaller than 325 mesh- 6 percent*" (Col. 3, Lines 48-
5 51), which is equivalent to a particle size distribution ranging from 600 down to 30 μm . The
6 above mentioned physical conditions of the particles further differentiates the Ayers Patent
7 from the '101 Application, since the '101 Application does not claim its invention depends
8 on "highly irregular shaped particles, and does disclose particle sizes for both the metal
9 matrix and reinforcement phases under 100 μm . It is well known in the art of powder
10 metallurgy that the shape and size distribution of the particles do significantly determine
11 properties of the product made from the particles. Therefore, the teaching from the Ayers
12 Patent is irrelevant to successfully achieve the results of the '101 Application.

13
14 7.1.3 In the Ayers' method, "*the as-atomized particles derived from*
15 *the atomizing process are encased in an elongated metal tubular sheath*" (Col. 3, Lines 64-
16 66), and "*the completely filled tube is then closed off and sealed by the second end cap 11,*
17 *which may be welded in place*" (Col. 4, Lines 11-12). It is apparent for one having ordinary
18 skill in the art of powder metallurgy that a welded seal of tube will prevent chemical
19 reactions including oxidation that oxygen in atmosphere could enter into the tube to react the
20 metal alloy powder, wherein a high degree of oxidation to iron will significantly damage
21 properties of the steel billet of the Ayers Patent. In contrast to the step of the welded seal in
22 the Ayers Patent, the '101 Application does not make the "frame" which contains the powder
23 mixture air tight. Thus the '101 Application can selectively choose inert atmosphere or
24 oxidative (air) atmosphere in the subsequent step of consolidation to control properties of the
25 produced billet. Therefore it is also irrelevant to compare the Ayers Patent with the '101
26 Application simply because each invention teaches different techniques for different
27 purposes.

28 7.1.4 The Ayers Patent lastly discloses that after the billet is

1 completed, "*the tubular encasement 10 is removed, typically by a grinding operation*" (Col.
2 6, Lines 45-46). This disclosure is also different from that of the '101 Application, wherein
3 the skin of the frame is an integral part of the final product.
4

5 7.2 The Rudy Patent "*relates to improved cemented carbide alloys and*
6 *more particularly to improved monocarbide alloys of titanium and molybdenum which are*
7 *substantially richer in carbon than the prior art alloys of these metals*" (Col. 1, Lines 4-8).
8

9 7.2.1 It is well known to one having ordinary skill in the art of
10 materials science that metal alloy is used to make a solid compound as taught in the Rudy
11 Patent, which the solid compound is called a cermet because the majority phase is a
12 ceramics. Said solid compound is not a composite as taught in the '101 Application having a
13 metal matrix phase containing a reinforce phase of materials. Disclosure of structural
14 element of atomic percent and mole fraction in the Rudy Patent further supports difference
15 between the Rudy Patent and '101 Application, where the Patent states "*The composition of*
16 *the carbide component used in ... of the invention can be expressed either in atomic percent*
17 *of the constituent elements, for example as $Ti_uMo_vC_w$ ($u + v + w = 100$), where u , v , and w*
18 *are respectively, the atomic percent of titanium, molybdenum and carbon present in the*
19 *alloy; or as relative mole fractions of the metal and interstitial element in the form*
20 *(Ti_xMo_y) C_z , ($x + y = 1$), whereby x and y are, respectively, the relative mole fractions (metal*
21 *exchange) of titanium and molybdenum, and z measures the number of gramatoms carbon*
22 *per gramatom metal"* (Col. 2, Lines 59-67, Col.3, Lines 1-3), and "*The two sets of*
23 *composition variables*" (u,v,w and x,y,z) "*are readily interconverted*" (Col. 3, Lines 6-7). In
24 addition, the disclosed formula in either $Ti_uMo_vC_w$ or $(Ti_xMo_y)C_z$ of the Rudy Patent is
25 consistent with a formula of the solid compound from Mahan, B.M, and Mayers, R.J,
26 University Chemistry, FOURTH EDITION, The Benjamin/Cummings Publishing Company,
27 Inc., Pages 4-5. Therefore it is impossible for the Rudy Patent to teach or suggest the '101
28 Application for its invention concerning a composite.

1 7.2.2 The Rudy Patent discloses that "*This monocarbide solid*
2 *solution ((Ti,Mo)C) is cemented with an iron group metal binder which forms between 5 and*
3 *25 percent by the weight of the total composition*" (Col. 2, Lines 12-15). This disclosure is
4 contrast to what the Examiner says that Rudy further discloses wherein the ceramic particles
5 are from 5 to 25 % of the powder mixture, overlapping the range as claimed by Applicant
6 establishing a prima facie case of obviousness", since the Rudy Patent specifically discloses
7 the iron group metal binder occupies between 5 and 25 percent by the weight of the total
8 composition. Therefore, the '101 Application is not obvious in view of Rudy.

9 7.2.3 More importantly, no matter how much percentage of the
10 metal binder phase is added into the monocarbide phase, the final product is the solid
11 compound of the cemented carbide alloy in the Rudy Patent, due to "*dissolution of the*
12 *carbide components in the binder at sintering temperatures and reprecipitation of the more*
13 *stable, equilibrium carbide solid solution from the liquid binder alloys*" (Col. 5, Lines 5-8).
14 The taught "*liquid binder alloys*" in the Rudy Patent is absolutely different from a physical
15 state of the metal matrix phase during consolidation in the '101 Application, wherein "The
16 consolidation temperature is lower than the melt temperature of the basic matrix metal" (Page
17 10, Lines 8-9). Therefore, the '101 Application is substantially different from the Rudy
18 Patent since there is NO dissolution of the reinforcement phase into the matrix metal phase
19 simply because the matrix metal phase cannot be liquified under the temperature lower than
20 the melt temperature of the metal matrix phase. Further, it is not difficult for one having
21 ordinary skill in the art of materials science to predict that microstructure of the products
22 from the Patent and Application is fundamentally different. From these differences, it is
23 clear that the Rudy Patent does not teach novel features of the '101 Application for a
24 composite wherein the metal matrix phase is not melted during the consolidation process.

25
26
27 In conclusion, the above analysis proves structural differences between the '101
28 Application and the Ayers and Rudy Patents by providing sufficient evidences including

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1 comparison of said structural difference. Therefore, the '101 Application is not obvious
2 based on a combination of the Ayers and Rudy Patents.

3
4 8. Therefore, it is respectfully submitted that the present '101 Application is now
5 in condition for allowance and issuance of a Notice of Allowance of the '101 Application is
6 respectfully solicited.

7 Respectfully submitted,

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10 Date: May 17, 2006

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